

# **HEAT DISSIPATING DEVICE HAVING IMPROVED FASTENING STRUCTURE**

## **BACKGROUND OF THE INVENTION**

The present invention relates to a fastening structure of a heat sink, and  
5 more particular, to a structure to prevent loose or displacement of a heat sink.

The development of information technology has continuously improved the designs and devices in the computer related industry. The information processed by the related products such as interface cards and central process units (CPU) involved with logic operation becomes larger and larger.  
10 Consequently, the operation speeds are faster and faster. The increasing operation speeds results in the elevated temperature during operation. To reduce the heat generated by the high-power devices such as Intel P4 processor or AMD K8 processor, a heat dissipating device with a large volume has been commonly adapted in the industry. The large volume of the heat dissipating  
15 inevitably increases the overall weight of the products, such that a higher standard for fastening or mounting the heat dissipating device is demanded.

Taiwanese Patent Application No. 90211070 has disclosed an improvement of a fitting structure of a CPU heat sink. The CPU heat sink is sandwiched between the motherboard and the CPU by fastening screws to  
20 prevent the heat sink from loosening away from the CPU due to inadvertent impact. However, this type of heat dissipating device requires a supporting board and a threaded column with a specific design, such that the applicability is very limited.

## **BRIEF SUMMARY OF THE INVENTION**

25 The present invention provides a heat dissipating device with an improved fastening structure. The fastening structure includes a plurality of through holes

such that the heat dissipating device can be attached to the heat dissipating device on various types and sizes of motherboards.

The present invention further provides a heat dissipating device that includes an improved fastening structure. The fastening structure uses fitting  
5 columns inserted through holes formed in a back plate and ensures that no relative rotation occurs between fitting plate and the fitting columns, such that the heat dissipating device is stably secured to the back plate.

The fastening structure provided by the present invention is used to fastening a heat dissipating device with a printed circuit board in which a  
10 plurality of holes is formed. The fastening structure comprises a back plate disposed underneath the printed circuit board and a plurality of fitting columns, wherein the back plate is perforated with a plurality of holes and each of the fitting columns includes an elongate hollow tube and an insertion member projecting from a periphery of one end of the hollow tube. The hollow tube has  
15 a threaded internal sidewall and the insertion member has a shape conformal to the respective holes at which the fitting columns are fixed to the back plate.

These and other objectives of the present invention will become obvious to those of ordinary skill in the art after reading the following detailed description of preferred embodiments.

20 It is to be understood that both the foregoing general description and the following detailed description are exemplary, and are intended to provide further explanation of the invention as claimed.

## BRIEF DESCRIPTION OF THE DRAWINGS

These, as well as other features of the present invention, will become  
25 apparent upon reference to the drawings wherein:

Figures 1 shows an exploded view of a fastening structure of a heat dissipating device provided by the present invention;

Figure 2 shows a perspective view of the fastening structure as shown in Figure 1;

Figure 3 shows an exploded view of applying the fastening structure as shown in Figure 1 to a heat sink;

5        Figure 4 shows a perspective view of the application as shown in Figure 3;

Figure 5 shows another embodiment of the fitting column as shown in Figure 1; and

Figure 6 shows another modification of the fitting column.

### DETAILED DESCRIPTION OF THE INVENTION

10        Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

Figures 1 and 2 show the exploded view and perspective view of a  
15        fastening structure used for fitting a heat sink to a heat generating device. The fastening structure includes a back plate 10 and a plurality of fitting columns 20.

The back plate 10 is fabricated from metal, plastic or other materials. The back plate 10 is placed underneath a motherboard of a computer. In this embodiment, the back plate 10 is substantially rectangular. The back plate 10  
20        includes two elongate slots 13 formed along two elongate sides thereof and two T-shape slots 13 form at two transverse sides between the elongate sides. Between the T-shape slots 13 and the transverse sides, the back plate 10 further includes a plurality of through holes 12. The through holes 12 are hexagonal, rectangular, circular, triangular or other polygonal according to specific  
25        requirement.

Preferably, the fitting columns 20 are fabricated from metal materials. Each of the fitting columns 20 includes an elongate tube 24 which has a

threaded internal surface and an insertion member 21 projecting from the periphery of a lower end of the elongate tube 24. The elongate tube 24 is hollow and has two opening ends. The insertion member 21 includes a groove 22 recessed from a periphery thereof. The insertion member 21 is configured  
5 conformal to the through holes 12 formed in the back plate 10.

Each of the fitting columns 20 further comprises an open washer 23 to be inserted into the groove 22 of the insertion member 21. Therefore, when the insertion members 21 are disposed in the through holes 12, the washers 23 hold the majority part of the fitting columns 20 over the back plate 10, while the  
10 attachment between the fitting columns 20 and the back plate 10 can be reinforced by screw members threaded into the lower ends of the fitting columns 20.

Figures 3 to 5 shows the application of the fastening structure as described above to a heat dissipating device 30 which is to be mounted on a heat  
15 generating device 41 on a printed circuit board 40. As shown, the printed circuit board 40 is sandwiched between the heat dissipating device 30 and the back plate 10. The printed circuit board 40 is perforated with at least two holes 42. The holes 42 are aligned with two through holes 12 formed along transverse sides of the back plate 10 allowing the fitting columns 20 fixed in the through  
20 holes 12 to penetrate through. The heat dissipating device 30 includes a frame 31, a thermal conductive block 32, a bracket 33 and a heat sink 34. The frame 31 is perforated with a central aperture 312 for accommodating the heat generating device 30 therein while being placed on the printed circuit board 40. Similar to the back plate 10, the frame 31 is substantially rectangular and has  
25 two transverse sides perforated with a plurality of through holes 311. The through holes 311 are aligned with the holes 42 formed in the printed circuit board 40 and the through holes 12 formed in the back plate 10. Therefore, the elongate tubes 24 can extend through to secure the printed circuit board 40

between the frame 31 and the back plate 10 by screw members 37 threaded into the upper ends of the fitting columns 20. Preferably, resilient members 36 such as springs are inserted between the heads of the screw members 37 and the printed circuit board 40.

5       The thermal conductive block 32 is placed on top of the heat generating device 41 within the frame 31. The thermal conductive block 32 is preferably formed of materials with good conductivity such as aluminum or copper, for example. As shown, the top surface of the thermal conductive block 32 is recessed to form a channel 321 extending across the top surface along an  
10   elongate direction of the thermal conductive block 32. The bracket 33 includes a central elongate member and two T-shape bracket members 331 extending from two opposing ends of the central elongate member. The central elongate member can be inserted into the channel 321 and is sufficiently long such that when the central elongate member is inserted in the channel 321, the T-shape  
15   bracket members 331 protrude from two longitudinal sides of the thermal conductive block 32. By overlaying the transverse sides of the frame 31 on top of the T-shape bracket members 331 and fastening the frame 31 to the printed circuit board 41 and the back plate 10, the thermal conductive block 32 is securely mounted to the heat generating device 41.

20       As shown in Figure 3, the fastening structure may further comprises a shock absorbing member 35 such as a layer of foam or sponge between the back plate 10 and the printed circuit board 40. The cross section of the heat sink 34 is substantially rectangular. The lower surface of the heat sink 34 is recessed to form a channel conformal to the cross section of the thermal conductive block  
25   32, such that the heat sink 34 can be place across the thermal conductive block 32. The lower corners of two lateral sides of the heat sink 34 are preferably removed, such that the lower portion of the heat sink 34 can be inserted into the frame 31.

As shown in Figures 6-7, the fitting columns 20 may further comprise bottom lids 25 as shown in Figure 6. The outer diameter of the bottom lids 25 is larger than the diameter of the holes 12 formed in the back plate, such that a blocking effect can be achieved. Similarly, as shown in Figure 7, a top lid may also be inserted on the insertion members 21 to achieve the holding effect similar to the washers 23 as shown in Figure 1.

The heat dissipating device and the fastening structure provided by the present invention has at least the following advantages.

1. Various types of through holes are formed in the back plate, such that the fastening structure is operative to secure the heat dissipating device to printed circuit boards with various configuration and sizes.

2. The fitting columns are fixed to the back plate to avoid a relative rotation between the fitting columns and the back plate. Therefore, the heat dissipating device is stably attached to the printed circuit board.

3. The printed circuit board and the heat generating device is sandwiched between the heat dissipating device and the back plate, such that damage of the printed circuit board and the heat generating device caused by impact is minimized.

This disclosure provides exemplary embodiments of the present invention. The scope of this disclosure is not limited by these exemplary embodiments. Numerous variations, whether explicitly provided for by the specification or implied by the specification, such as variations in shape, structure, dimension, type of material or manufacturing process may be implemented by one of skill in the art in view of this disclosure.